

SOME NOTES ON THE PROPOSED NEOTYPE FOR *BELEMNITES*
MUCRONATUS LINK, 1807. Z.N.(S.) 1160

(see volume 21, pages 268–296; volume 22, pages 138–139, 343–345;
volume 23, pages 70–71)

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General Remarks

I quite agree with all Dr. Jeletzky's (1964, p. 278–279) suggestions as to a neotype for *Belemnites mucronatus* Link, 1807 and as to generic names *Belemnitella* d'Orbigny, 1842 and *Belemnella* Nowak, 1913, except for paragraph 2.

2. In paragraph 2, *Belemnites mucronatus* Link, 1807 (coll. no. BMC-43542, paleontological collection of the British Museum (Natural History)) is proposed by Jeletzky as a neotype. This specimen with 21 other guards was collected by Dr. A. W. Rowe from the *Belemnitella mucronata* zone s. str. (Upper Campanian) in 1926. This locality is the Edward's Pit at Mousehold Heath (Norfolk, England).

3. N. Peake and D. Hancock (1966, p. 343–345) reject this suggestion, as neither the horizon nor the place of the find are known exactly. In the region pointed out by Jeletzky, and by the evidence of Peake and Hancock, there are no good exposures now and therefore topotypes cannot be found there. From their point of view the neotype of the species must be chosen from specimens which should be gathered from the well-exposed succession of the zone *Belemnitella mucronata* either near Misburg (Hannover) or near Lägerdorf (Golschintia). Most modern authors (Birkelund, 1957, p. 30–31; Jeletzky, 1958, p. 45 and oth.; Naidin, 1956, p. 19, 1959, p. 203; Peake and Hancock, 1961, p. 319 and others) accept this species in the sense of A. D. Arkhangelsky (1912, p. 600–606, pl. IX, fig. 3, 9, 23, 26, pl. X, fig. 10). Therefore the suggestion of R. Kongiel (1962, p. 30, p. 92–93) to accept as neotype the specimen of *Belemnitella mucronata* mut. *senior* Nowak, 1913, which is figured in Jeletzky's paper (Jeletzky, 1948a, pl. XX, fig. 2), can hardly be accepted. I agree with Dr. Jeletzky's (1964, p. 279–280) arguments against Kongiel's suggestion.

4. This species has been described in detail in the paper of A. D. Arkhangelsky (1912), where for the first time a restricted sense of the species has been given (see Jeletzky, 1964, pp. 271–272).

5. T. Birkelund (Birkelund & Wienberg Rasmussen, 1956, pp. 80–86; Birkelund, 1957, pp. 30–31) suggests as a neotype of *Belemnites mucronatus* Link the guard figured by A. D. Arkhangelsky on plate IX, fig. 3 and 9. This suggestion has been supported by D. P. Naidin (1964, a footnote on page 89). J. A. Jeletzky (1964, p. 279, see also Birkelund, 1957, p. 30) agrees with this opinion in general features.

6. However, the case is complicated by the fact that the specimen from the Campanian deposits near the Podvalie Village on the Volga River, figured on pl. IX, fig. 3 and 9, pl. X, fig. 10,* has been lost. Original specimens for the monograph

* Fig. 3, pl. IX—a guard from ventral view; fig. 9, pl. IX—laterally; fig. 10, pl. X—dorsally. (In the explanation for the figure the guard has been erroneously shown to be in lateral view.) "The Upper Cretaceous deposits of East European Russia" by A. D. Arkhangelsky are being kept in the Central Scientific Research Geological Exploration Museum, named after Academician F. N. Chernyshov (Leningrad), in the collection No. 2276. Of the forms described by Arkhangelsky as *Belemnitella mucronata* Schlotheim, but a fragment of the guard has been preserved in the collection mentioned above (photo, fig. 23, pl. IX).

7. It should be noted that according to Articles 46 and 50b of the International Code of Zoological Nomenclature a nominate subspecies and species must have the same author but not different ones, as it has been suggested by Jeletzky (1964). Besides, we ought to agree with Melville's and Wood's arguments (1966, p. 71) and to consider Schlotheim to be the author of the species and not Link as is proposed by Birkelund & Rasmussen (1956, p. 88), by Birkelund (1957, p. 30), by Jeletzky (1964, p. 269).

Suggested neotype, horizon and age

8. I suggest as a neotype the specimen No. 8029/12 (in the present paper pl. I, fig. 1) from the collection No. 22 of the Moscow University Earth Sciences Museum. The specimen (its figure, but without indication of the author, has been shown in Naidin's paper, 1959, p. 203, text-fig. 23-1) has been taken from the same outcrop as the specimens of A. D. Arkhangelsky (1912, pl. IX, fig. 3, 9, 26, pl. X, fig. 10). This outcrop is situated on the right bank of the Volga River near the Podvalie Village (Novodevichensky district of Kuibyshev province).

9. The succession of the beds forming the outcrop is the following (from top to bottom):

- | | |
|---------------|---|
| Cr_2^{mst1} | 1. White soft chalk with <i>Belemnuella lanceolata</i> (Schlotheim) . . . over 25 m |
| Cr_2^{cmp2} | 2. Dark-grey marl clays with extremely scarce guards of <i>Belemnitella langei</i> Jeletzky 4,5-5, 0m |
| Cr_2^{cmp1} | 3. Greyish-white coarse chalk, with glauconite grains, especially abundant at the base, with numerous guards of <i>Belemnitella mucronata mucronata</i> (Schlotheim) Arkhangelsky plus one guard of <i>Paractinocamax grossouvrei pseudotoucasii</i> Naidin at the very base. Considerable silicification of some guards is characteristic. Foraminifera which have been found in this bed: <i>Valvulineria laevis</i> Brotzen, <i>Gyroldina turgida</i> (Hagenow), <i>Globorotalites michelinianus</i> (d'Orbigny), <i>Eponides moskvini</i> (Keller), <i>Anomalina</i> (<i>Pseudovalvulineria</i>) <i>clementiana pseudoeexcavata</i> (Kalinin), <i>Anomalina</i> (<i>Brotzenella</i>) <i>montereiensis</i> (Marie), <i>Cibicides</i> (<i>Cibicoides</i>) <i>eriksdalensis</i> (Brotzen), <i>C.</i> (<i>C.</i>) <i>aktulagayensis</i> Vassilenko, <i>Bolivina</i> <i>oides</i> cf. <i>decoratus</i> Jones, <i>B. laevigatus laevigatus</i> Marie and others 3,2-3,5 m |

The top of the chalk bed 3 is a typical hard ground with wormtubes, filled in with clays of the bed 2.

- | | |
|---------------|---|
| Cr_2^{cmp1} | 4. Dark- and light-grey siliceous marls with brown phosphorites and phosphatized sponges (at the bottom), containing <i>Belemnitella praecursor</i> Stolley, <i>Actinocamax laevigatus laevigatus</i> Arkhangelsky, <i>Oxytoma tenuicostatum</i> (Roemer) ("pteria beds") 8,0-9,0 m |
|---------------|---|

The top of "the pteria beds" (bed 4) as well as that of the bed 3 is an uneven hard ground surface.

10. Thus, the bed 3, from which guards of *Belemnitella mucronata* (Schlotheim) Arkhangelsky have been taken is characterized by small thickness and is limited by erosional surfaces. In my opinion this layer should be referred to the lowest part of the lower zone of the Upper Campanian, most probably corresponding to the zone of *Belemnitella mucronata senior* of Schmid and Ernst. This conclusion is based on the fact that in a number of the Russian Platform outcrops (particularly near the Rybushka Village in Saratov province, near the town of Seraphimovich on the Don River in Volgograd province) the deposits, containing guards of *Belemnitella mucronata mucronata* only (part of the sequence of these deposits corresponds to the bed 3 of the Podvalie section), immediately overlie the beds containing both *Belemnitella mucronata mucronata* and the guards of *Belemnellocamax mammillatus* (Nilsson). The latter occur at the top of the Lower Campanian of the West Germany sections (Stolley, 1930, p. 186; Ernst, 1963, p. 119).

11. That bed 3 belongs to the bottom of the Upper Campanian is confirmed also by the foraminifera—*Cibicides* (*Cibicoides*) *aktulagayensis* Vassilenko, *Anomalina* (*Brotzenella*) *montereiensis* Marie.*

12. In the outcrops located nearby chalk beds with numerous guards of *B. mucronata mucronata* contain not only foraminifera which have already been listed, but also the forms which are characteristic for the Lower Campanian of the Russian Platform—*Cibicides* (*Cibicoides*) *temirensis* Vassilenko, *Anomalina* (*Pseudovalvulin-*

* The foraminifera have been determined by V. N. Benjamovsky.

eria) dainae Mjatluk and others. So on the whole, the chalk sediments with *B. mucronata mucronata*, in the Novodevichensky district, include beds which may be considered transitional between the Lower and Upper Campanian.

Short description of the neotype guard

Preserved length—102 mm; reconstructed full length R does not exceed 115–120 mm. Postalveolar length r_a (a distance between the beginning of the ventral fissure and the apex) is 88 mm. The largest lateral diameter LL is 17.6 mm. Ratio of elongation $\frac{R}{LL} = 6.5$. In ventral or dorsal view the guard is of cylindrical shape with very slight narrowing at the beginning of ventral fissure, laterally the guard forms a very high cone. Apical end is rounded and supplied with a pronounced "mucro".

On the surface of the guard dorso-lateral depressions, passing into even double dorso-lateral furrows as well as lateral furrows, are very well defined.

Distinct are smaller vascular imprints, branching off from dorso-lateral furrows at acute angle. Imprints in alveolar part of the ventral side are particularly deep. Longitudinal striations are of minor importance, being traced in apical part of the guard only.

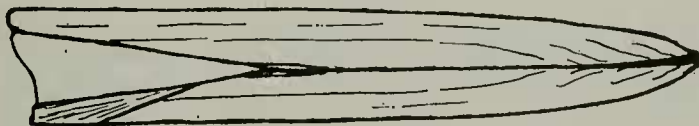
Deep alveolus is covered by well-preserved conotheca: $\frac{A}{R} = 0.45$. The angle of the alveolar cone is 20–21°. The bottom of the ventral fissure is a straight line, forming an acute angle with the alveolus wall. Schatsky index e —a distance between the embryonic bulb (protoconch) and inner end of the ventral fissure bottom—is 9.5–10 mm. Fissure index h (a distance on the guard surface along the fissure between the outer end of the fissure bottom and the point at the level of the inner end of the fissure bottom) is 14–15 mm (see fig. 1.).

The first visible guard is a conical one; its length from protoconch is 8–10 mm.

Type series

Apart from the specimen No. 8029/12, 32 *Belemnitella* guards, which can be divided into two groups, have been taken from the bed 3.

The first group (8 guards) consists of guards, having the same length and shape as the guard of the suggested neotype. Their R is over 100 mm, about 110–130 mm; r_a —87–108 mm; LL —17–19 mm; $\frac{R}{LL} = 6.5$; $\frac{A}{R} = 0.45$; e —8–10 to 11 mm; the ventral fissure bottom is a straight line with average h —14–18 mm. The surface sculpture of but one specimen No. 8029/6 is characterized by the predominance of longitudinal striae over vascular imprints. The sculpture of the remaining specimens resembles that of the guard No. 8029/12. Thus, the specimen No. 8029/6 shows a characteristic allying it with *Belemnitella praecursor media* Jeletzky. The remaining



EXPLANATION OF TEXT-FIG. 1

Text-fig. 1. *Belemnitella mucronata mucronata* Schlotheim, 1813 sensu Arkhangel'sky, 1912. (Natural size). Longitudinal dorso-ventral split of the guard no. 8029/12, suggested as a neotype. (See pl. 1, fig. 1). The lower part of the Upper Campanian, the Podvalie Village on the Volga River (Novodevichensky district, Kuibyshev province).

7 guards are topotypes of *Belemnitella mucronata mucronata* (Schlotheim) Arkhangelsky.

The second group (24 guards) consists of guards differing from the specimen No. 8029/12 mostly in smaller sizes; $R=75-95$ mm; $r_a=59-78$ mm; $LL=11-13.5$ mm; $\frac{R}{LL}=6.5-7.0$; in lateral view the guards form high cones, in dorsal-ventral aspect they have distinct narrowing at the level of the ventral fissure beginning or somewhat lower. $\frac{A}{R}$ is 0.35–0.45 (in average—0.40); e is 7–8 mm; the ventral fissure is usually straight, forming an acute angle with the alveolus wall ($h=10-16$ mm), in rare cases the bottom of the ventral fissure is somewhat sinuous and shorter, in such cases the value of h is lower. Only 3 of the 24 guards are characterized by faintly sculptured surface with some predominance of longitudinal striae over the vascular imprints. The three guards mentioned above may be, probably, referred to *Belemnitella praecursor mucronatiformis* Jeletzky. The remaining 21 specimens bear strong resemblance to the subspecies just mentioned, identified by Jeletzky (1955, p. 497, pl. 56, fig. 5), but differing from it in sharp and deep vascular imprints. These guards are also referred by me to *Belemnitella mucronata mucronata* (Schlotheim) Arkhangelsky. Short guards, collected from the exposure near the Podvalie Village are also described by A. D. Arkhangelsky as *Belemnitella mucronata* Schlotheim (1912, pl. IX, fig. 26). (See below the section "Variability" in the description of nominate subspecies *Belemnitella mucronata mucronata* (Schlotheim) Arkhangelsky.)

Description of nominate subspecies *Belemnitella mucronata* (Schlotheim, 1813) sensu Arkhangelsky, 1912

Belemnitella mucronata mucronata (Schlotheim, 1813) sensu Arkhangelsky, 1912

Text-fig. 1, pl. 1, fig. 1–6

1912. *Belemnitella mucronata* Arkhangelsky, p. 600, pl. IX, fig. 3, 9, 23, 26, pl. X, fig. 10.
 1955. *Belemnitella mucronata*, unnamed early variety Jeletzky, pp. 480–482, pl. 57, fig. 1.
 1956. *Belemnitella mucronata mucronata* Naidin, p. 19.
 1958. *Belemnitella mucronata* Nikitin, p. 17, (pars).
 1958. *Belemnitella mucronata* var. *mucronata* Jeletzky, p. 45.
 1959. *Belemnitella mucronata mucronata* Naidin, p. 203, text-fig. 23.
 1964. *Belemnitella mucronata mucronata* Jeletzky, pp. 279–289, pl. 1, fig. 1, 3 (in the explanation of the pl. 1 erroneously 2), 4, text-fig. 1.
 1964b. *Belemnitella mucronata mucronata* Ernst, p. 194, pl. 1, fig. 6.

Short Description

Two types of guards: LARGE guards with length reaching 110–135 mm, post-alveolar length is 85–100 mm, the maximum lateral diameter is 18–19.5 mm and SMALLER guards 75–95 mm in length, post-alveolar length is 59–80 mm, the maximum lateral diameter is 11–13.5 mm. Ratio of elongation of the guards is $\frac{R}{LL} 6.5-7.0$.

In dorso-ventral view the guards are almost cylindrically-shaped, but with slight narrowing in the proximity of the alveolar fissure: the presence of a "waist" at the level of the alveolar fissure beginning or somewhat lower is characteristic. Laterally the guards form a very high cone. Apex is rounded, there is a micro.

On the surface of the guards dorso-lateral depressions, double dorso-lateral and lateral furrows as well as closely spaced smaller vascular imprints are well developed. Vascular imprints on the ventral side near the alveolar fissure are particularly sharply pronounced. The vascular imprints branch off the dorso-lateral furrows at an acute angle. Elements of longitudinal sculpture (striae) are weakly developed.

Alveolar cavity has well-preserved conotheca. The angle of the alveolus cone is $20-22^\circ$. The depth of the alveolus constitutes from 0.4 (rarely, 0.35) to 0.45 of the whole guard length. Schatsky index e is from 7-8 to 10-11 mm, usually 8-10.* The ventral fissure bottom is usually represented by a straight or almost straight line, under low angle to the alveolar wall; in such cases a fissure index h is 14-21 mm. In rare cases the ventral fissure bottom is a line with some bend downward or a somewhat sinuous line. In such cases the value of h is 7-12 mm and even less.

* As the course of the ventral fissure bottom forms an acute angle with the alveolus wall, it is sometimes difficult to determine the exact position of the inner end of the bottom course and, consequently, it is impossible to make exact measurements.

Variability

Both long and comparatively short guards, but in general having quite the same characteristic features, occur together. In a number of cases the relation of the quantity of short and long guards is different in various horizons. Thus, for example, in the section near Rybushka Village (Saratov region) in beds containing *Belemnelloccamax mammillatus* (Nilsson) rather abundant long guards occur (of 30 guards 9 are characterized by $r_a=80-90$ mm, 6— $r_a=70-80$; 9 with $r_a=60-70$, 6— $r_a=50-60$ mm), while in the beds immediately overlying these, containing no *Belemnelloccamax mammillatus*, guards of *Belemnitella mucronata mucronata* are in general shorter (of 29 specimens only 1 has r_a exceeding 80 mm, 4 have $r_a=70-80$ mm, 15 have $r_a=60-70$ mm, 7— $r_a=50-60$ mm, and 2— $r_a=40-50$ mm). Long guards are usually common for Uljanovsk, Volga basin, while comparatively short, slender guards with distinct "waist" are abundant in the sections along the Desna River (Chernygov province).

In the present article both types of guards are referred to one subspecies. There are no grounds, except the difference in size, for referring them to different subspecies (see the section "General remarks"). The difference in guard size, probably, may be explained by sexual dimorphism(?).

Affinities and differences

The nominate subspecies differs from other very widespread subspecies of *Belemnitella mucronata senior* Nowak, 1913 in more slender and less corpulent guards (elongation

ratio $\frac{R}{LL} = 6.5-7.0$ as compared with 5.5-6.0, rarely 6.5 in *B. mucronata senior*), somewhat more shallow alveolus as well as in stable straight course of the ventral fissure bottom.

The guards of the subspecies (particularly short ones) strongly resemble those of *Belemnitella praecursor mucronatiformis* Jeletzky, 1955, with which they are connected by gradual transition. The difference between them is in the presence of distinctly pronounced "waist" in the nominate subspecies of *B. mucronata* responsible for lanceolate-shape of the guard in dorso-ventral view. The second difference is in the considerably sharper vascular imprints, and, on the contrary, in weaker development of longitudinal striae in *B. mucronata mucronata* as compared with *B. praecursor mucronatiformis*. In appearance the guards of *B. mucronata mucronata* strongly resemble the guards of the Upper Campanian *Belemnitella minor* Jeletzky, 1951. Differentiation of these forms by single specimens seems almost impossible. The most essential difference in the structure of the ventral fissure is the following: fissure index of *B. mucronata mucronata* is of higher value, the bottom of the ventral fissure is a longer and usually straighter line and therefore its ventral fissure is shorter than that of *B. minor*.

Short guards of the nominate subspecies of *B. mucronata* resemble those of *Belemnitella langei* Jeletzky, 1948 (Jeletzky, 1948b); however they differ from the latter in deeper wrinkles, deeper alveolus as well as high values of Schatsky and fissure indices.

General remarks

As has already been mentioned, both long and comparatively short forms can be referred to *Belemnitella mucronata mucronata*. The long guards are represented by

the specimen, shown by A. D. Arkhangelsky on pl. IX, fig. 3 and 9, pl. X, fig. 10, and the forms given by J. A. Jeletzky (1955, p. 480-482, pl. 57, fig. 1; 1958, p. 45). The latter are represented by short guards from the Podvalie Village (Arkhangelsky, 1912, pl. IX, fig. 26), by short slender varieties of *Belemnitella mucronata* (Schlotheim) s. l. Jeletzky (1958, p. 33, 42 and oth.) (except short varieties of *B. mucronata* s.l. of the same author, shown in the point 2, p. 42!).

Belemnitella elegans of Vassilenko and Rasmyslova (1950, p. 605, text-fig. 11') can be evidently referred to the latter as well. Specimens from Campanian deposits of Southern Sweden, named by J. Moberg (1885, p. 56, pl. VI, fig. 13 and 14) as *Belemnitella mucronata* Schlotheim can be probably referred to this subspecies. The specimen, shown on the fig. 13, has been taken from the beds containing *Belemnella-camax mammillatus* (Nilsson) (Ivö region, South Sweden). The specimen from Köpings (Southern Sweden), given on fig. 14, cannot be very reliably correlated with this subspecies.

Stratigraphic and geographical distribution

The form described above is common for the upper part of the Lower Campanian (beds with *Gonioteuthis quadrata gracilis* and *Belemnellocamax mammillatus*) and for the lower part of the Upper Campanian of Great Britain, BRD, South Sweden, Poland, European part of the USSR (central region, Volga basin, Caspian syncline, Dnieper-Donetz depression, Crimea).

EXPLANATION OF PLATE 4

All figures in natural size

- Belemnitella mucronata mucronata* Schlotheim, 1813 sensu Arkhangelsky, 1912
Figs. 1A-1C. The proposed neotype. No. 8029/12. Lower part of Upper Campanian, near the Podvalie Village (Novodevichensky district, Kuibyshev province).
A. Ventral view; B. Lateral view; C. Dorsal view.
- Fig. 2. A guard with a short alveolar fissure; the fissure index is 18 mm. No. 8029/3. The lower part of the Upper Campanian, the Podvalie Village (Novodevichensky district, Kuibyshev province). Ventral view.
- Figs. 3A-3C, 4A, 4B. Short guards (= *Belemnitella elegans* Vassilenko and Rasmyslova, 1950, text-fig. 11'). Both guards were taken from the same bed and outcrop as guards, shown on the figs. 1 and 2.
3—No. 8034/5, A. Ventral view, B. Lateral view, C. Dorsal view.
4—No. 8029/7, A. Ventral view, B. Longitudinal split.
- Fig. 5. No. 366-2/2. The base of the Upper Campanian, Arskoe-Pogreby Village (Uljanovsk province). Ventral view.
- Fig. 6. No. 97. The top of the Lower Campanian (together with *Belemnellocamax mammillatus* (Nilsson)), Goltzovka Village (Pensa province.) Longitudinal split.

All specimens are kept in the collection no. 22 of the Moscow University Museum of the Earth Science.



IA



IB



IC



2



5



3A



3B



3C



4A



4B



6

